Dredging Research

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Uniform Corps specification for dump scow monitoring to interface with Silent Inspector

by James Rosati III and Gary Howell, ERDC, Coastal and Hydraulics Laboratory

Engineers and scientists working under the Dredging Operations and Environmental Research (DOER) Program work unit "Silent inspector for scows and mechanical dredges" have opened a dialog with industry to develop a common guide specification for dump scow monitoring. The Corps is simultaneously releasing a "requirements specification" and issuing a "request for information" to dredge contractors and instrumentation providers. Comments on the requirements, and information provided on the capabilities of commercial equipment, will be used to develop guide specifications targeted for use by all Corps districts.

New specification impact

A key requirement of the new specification is a real-time link to the Corps' Silent Inspector dredge contract management database (SIDB). Originally developed for hopper dredges, later DOER work extended the database and supporting computer programs to include pipeline dredges. With support from the scow work unit, the database has now been extended to support monitoring and tons dry solids analysis for dump scows. Corps personnel nation-wide can view data in the SIDB, making scow-monitoring data available as soon as it's received.

Scow monitoring for Corps dredge projects has increased over the years due to interest by environmental and regulatory agencies. Unlike a hopper dredge, a dump scow has minimal facilities to support instrumentation and computers (Figure 1). This has led contractors to use custom instrumentation systems to meet contract-monitoring requirements. Each district with scow-monitoring requirements has developed its own set of specifications, and monitoring systems are rarely compatible between contractors and districts.

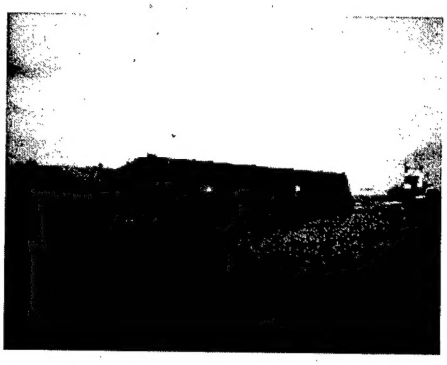


Figure 1. A split hull scow opened to dump a load. The minimal facilities aboard scows create a challenging environment for instrumentation.

One of the goals of the new DOER work is to follow the approach successfully used for the development of the Silent Inspector for hopper dredges. This system uses contractor-supplied and contractor-maintained equipment, but provides data in a Corps-specific format. These data are transferred to the SIDB, a database with common metadata (data about the data) that support all district dredging. The research goal is to combine the scow-monitoring requirements of all the districts into a common guide specification that would allow contractors to deploy the same instrumented scows at any Corps district. Creating a larger market for a common instrumentation system that permits multiple-sourced, commercial off-the-shelf equipment should result in lowered costs.

Specification development

The requirements specification (*http://si.wes.army.mil/*) is the first step in the development of a scow system specification. It lays out the broad goals of the system and details the minimum data requirements. As such, the requirements specification can be seen as a "What to do" document that

In this issue . . .

guides the development of the "How to do" guide specification. Review of existing scow-monitoring specifications used in the districts and discussion of future needs with the Corps dredging community yielded information about needs such as basic tracking for management and safety compliance, as well as comprehensive monitoring for contaminated sediments management.

Research staff developed several paper designs of instrumentation systems that would meet the requirements. The results showed that existing technology developed for the transportation industry for basic tracking requirements could be adopted. Because of the larger market for this equipment and the well-developed satellite communications infrastructure, a tracking system adapted to the needs of dredging could potentially be acquired at relatively low cost.

While evaluating the sensor and data analysis required for the more stringent requirements, it was found that implementations resembled a miniaturized, hardened version of the Silent Inspector hopper dredge system. The paper designs showed that such systems could be constructed at significantly lower cost than the current costs experienced by districts. Even so, a wide range of costs still existed between the basic tracking systems and, for example, a system used to support a MDFATE data collection requirement (*http://www.wes.army.mil/el/elmodels/* for MDFATE). Districts with minimal requirements will not use the guide specification if doing so results in the requirement to use a more expensive solution.

The following recommended approach is based on a single guide specification with options that can be selected by the contracting officer for each contract specification. The usage profiles are:

- Tracking profile
- Monitoring profile
- Tons dry solids (TDS) profile

The Tracking profile provides a record of the time-position history of the scow annotated with the open/closed position of the split hull. The Monitoring profile includes the requirements of the tracking profile plus instrumentation to provide the speed and higher resolution timing and track information on loading and dumping events. The TDS profile includes all of the requirements of the Monitoring profile plus instrumentation and computers required to compute the total dry weight of the sediment load.

Also imposed is a requirement that the guide specification structure the system specifications so that a contractor can implement profiles with equipment that can be upgraded to a higher functionality profile. Borrowing again from successful Silent Inspector hopper dredge concepts, the system is divided into subsystems that can be independently specified. Figure 2 shows a block diagram of the system partition plan.

The system is composed of three subsystems:

- Transducer subsystem (TSS)
- Scow specific subsystem (SSS)
- Scow common subsystem (SCS)

The TSS and SSS will have functional specifications, which means the guidance specification will specify only the output data at the interfaces to the subsystem. The contractor is free to use any type of equipment or installation he chooses to provide this data. The SCS may be required to run a government-furnished computer program, much like the hopper dredge specific system. Otherwise, it may be implemented with equipment selected by the contractor.

For the basic Tracking profile, only the SSS and TSS are required. In this case, the only transducer is an indicator of the open/closed status of the hull or dump doors. This will allow an off-the-shelf system to meet the specifications for any type of scow.

For the Monitoring profile, the TSS consists of differential GPS and hull displacement sensors. For TDS, both hull displacement and hopper level sensors are required similar to hopper dredges (Technical Note DOER-I6 at

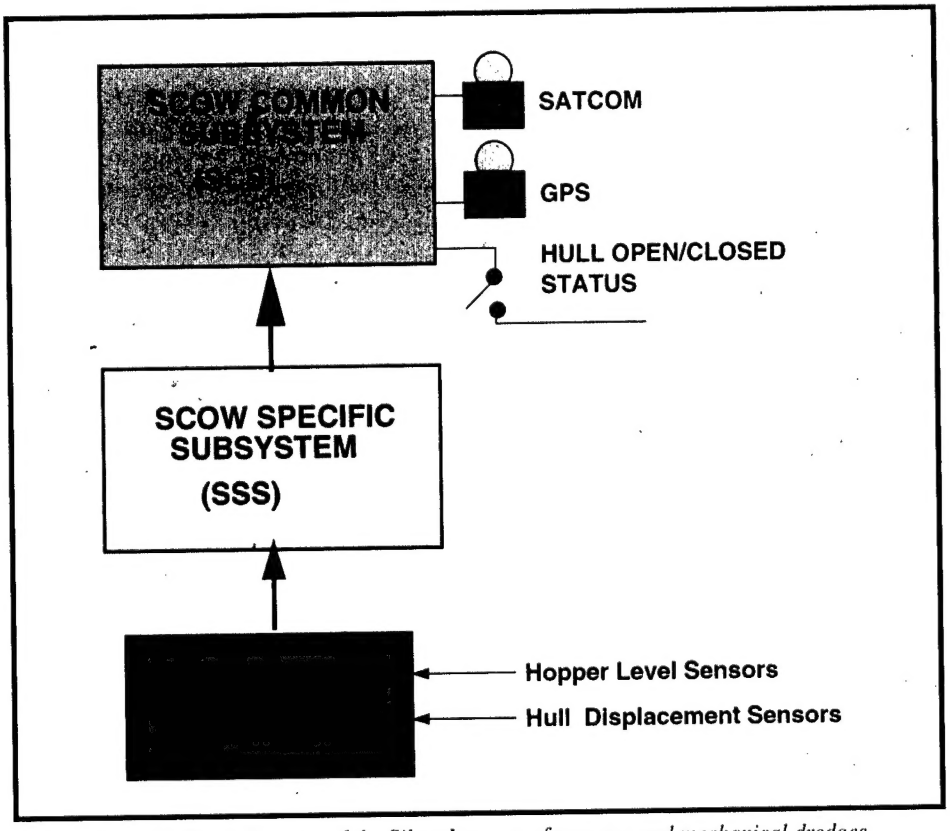


Figure 2. Block diagram of the Silent Inspector for scows and mechanical dredges.

MDFATE references

Moritz, H.R. and Randall, R.E. (1995). "Simulating Dredged-Material Placement at Open-Water Disposal Sites," Journal of Waterway, Port, Coastal, and Ocean Engineering, Vol. 121, No. 1, Jan/Feb 1995, ASCE.

Clausner, J., Gailani, J., Bratos, S., Johnson, B., Schroeder, P., and Teeter, A. (2001). "Status of Corps dredged material fate model," Proceeding of Western Dredging Association XXI Annual Conference, Center for Dredging Studies, TAMU, College Station, TX, pp 55-70.

http://www.wes.army.mil/el/dots/doer/pdf/doeri6.pdf).

The TDS profile provides the possibility of future payment options in addition to rental for some contracts. A side benefit of the sensor suite for the TDS profile is the ability to detect any material losses that occur during staging and transit from the dredge site to the disposal site.

Data transmission

All profiles require a common data transmission approach based on satellite data communications. The specifications will define the format of a Simple Mail Transport Protocol e-mail message and an Internet e-mail address where the message will be sent. The contractor may select any of present or future commercial satellite data communications systems to send the message. An important cost savings of this approach is that data storage and collection on the scow are eliminated. Analysis and reports are produced by the Silent Inspector system in a common format for all dredge contracts. The SIDB server automatically processes the incoming e-mail from all the operating scows, nationwide. The contractor-supplied systems will only be required to produce the human readable e-mail message with the required data items. Quality assurance/quality control procedures will be provided so that local district inspectors can easily determine if accurate data are received. Satellite data transmission also permits the monitoring system to operate completely unmanned, resulting in significant cost savings.

Summary

In order for the guide specification to achieve the goal of a Corps-wide standard, broad support and concurrence from districts, industry, and state and local partners are required. One of the reasons for the relatively smooth adoption of the Silent Inspector for hopper dredges by industry partners was the active involvement by the partners in development of the specifications. Continuing this partnership approach for the scow specification should bring about the same kind of support. The DOER research team invites all interested parties, inside and outside the Corps, to review the requirements document at *http://si.wes.army.mil*. Comments should be addressed to the local District or directly to the DOER team. Contractors should respond to the Corps' "Request for Information" published in the *Commerce Business Daily*. Instrumentation manufacturers and contractors are encouraged to contact the DOER research team and directly provide any relevant information.

The points of contact for the DOER team are James Rosati III (*James.Rosati@erdc.usace.army.mil*) or Gary Howell (*Gary.L.Howell@erdc.usace.s.army.mil*).

Dredging Calendar – 2002

February 23-27 – Water Environment Federation, Watershed 2002, Fort Lauderdale, FL. **POC:** *www.wef.org*

April 16 – Environmental Windows Workshop, "Achieving Dredging Decisions that Balance Economic and Environmental Concerns," Vicksburg, MS. **POC:** *Maryjane.robertson@usace.army.mil*, FAX 703-428-8171, telephone 703-428-6286 or 7072.

April 17-19 – PIANC 100th Anniversary Meeting, "New Era for Water Transportation," Vicksburg, MS. **POC:** *Maryjane.robertson@usace.army.mil*, FAX 703-428-8171, telephone 703-428-6286 or 7072.

May 5-8 – ASCE: Dredging '02, Orlando, FL. **POC:** *conf@asce.org*

May 13-16 – WEFTEC Asia Pacific 2002, Kuala Lumpur, Malaysia. **POC:** *weftecasiapacific@wef.org*

June 12-15 – Western Dredging Association WEDA XXII, Texas A&M 34th Annual Dredging Seminar, and Exposition, Omni Interlocken Resort, Denver, CO. **POC:** FAX 360-750-1445, mail WEDA, POB 5797, Vancouver, WA 98668-5797

July 9-11 – EPA and U.S. Army Corps of Engineers, Dredged Material Assessment and Management Seminar, Crowne Plaza Union Square, San Francisco, CA. **POC:** online, *www.wes.army.mil/el/dots/training.html* , FAX 601-634-3528, e-mail *Billie.H.Skinner@erdc.usace.army.mil*

September 22-26 - PIANC 30th International Navigation Congress, Sydney, Australia

Nov - SETAC, Salt Lake City, UT.

Dredging calculators and screening tools now available online

Several new interactive screening tools are available through the Dredging Operations and Environmental Research (DOER) program at *http://www.wes.army.mil/el/dots/doer/tools.html*.

These routines are divided into three categories: general tools, dredging operations, and miscellaneous routines. These relatively simple interactive routines allow users to input parameters and receive a solution quickly. Each routine is designed to reject unrealistic input. The results are considered as a quick-and-rough estimate for planning and design. A thorough evaluation should be considered by a qualified design engineer before implementation on a particular project.

General Tools

- Depth of Residence - determines the water depth at which a normally distributed sand/coarse-silt (not including cohesive material) sediment becomes mobile.
- Eroded Versus Accreted Beaches - can be used to evaluate the stability of an existing beach or a beach fill, as well as assess the cross-shore direction of movement of artificial sandbars placed in the nearshore.
- Fall Velocity of Sand - estimates the terminal fall velocity of sand.
- Frequency of Wave Occurrence - determines how often extreme wave conditions are expected over a specified time period.
- Miscellaneous Soil Calculations – calculates the water content of soil, dry density of soil, volume of solids in soil, void ratio, porosity, and degree of saturation.

For additional information and to submit ideas for additional routines and/or changes, contact Jack E. Davis, PE (601-634-3006, *Jack.E.Davis@erdc.usace.army.mil*), Jeffrey Melton (601-634-4035, *Jeffrey.S.Melton@erdc.usace.army.mil*), or Doyle L. Jones (601-634-2069, *Doyle.L.Jones@erdc.usace.army.mil*).

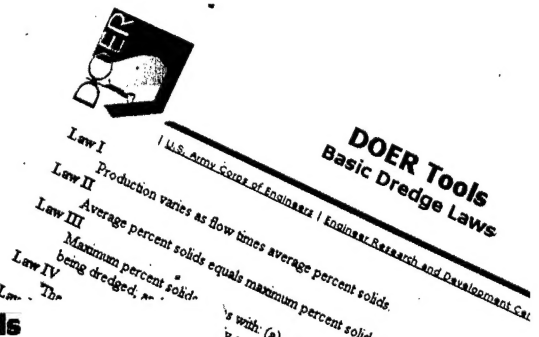
Dredging Operations

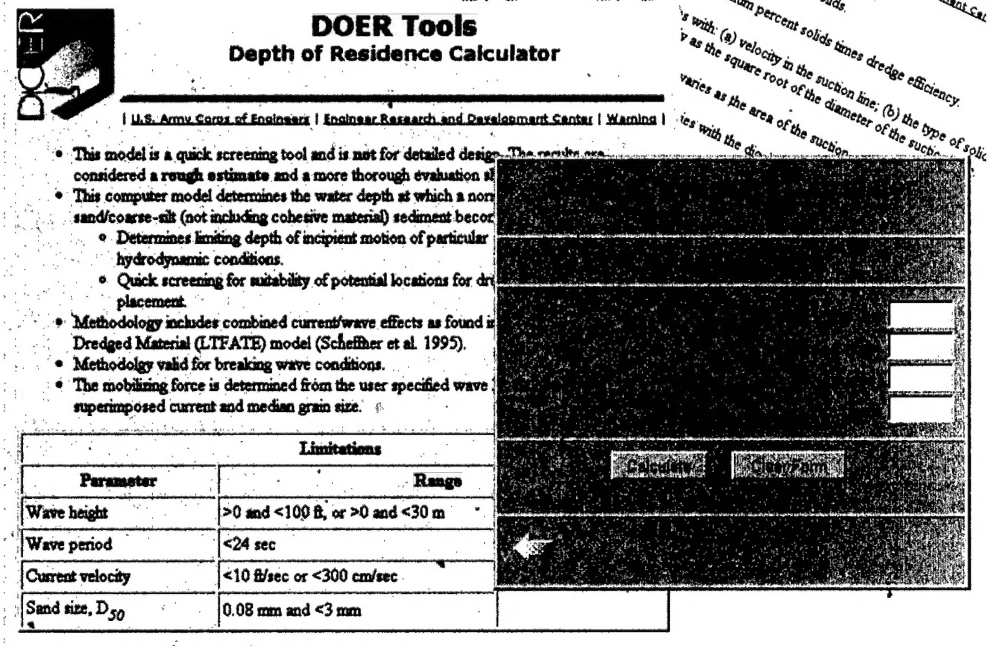
- Dredge Pump Horsepower – determines the engine horsepower needed given slurry rate, specific gravity of slurry, head, and pump efficiency.
- Flow Through a Pipeline – is determined using flow velocity and diameter of pipe.
- Production of a Hydraulic Dredge – is determined using slurry rate and average solids in slurry (percent).
- Velocity of Pipeline Flow – is determined using flow rate and diameter of pipe.
- Velocity Requirement of Different Pipe Sizes – is determined by initial and final pipe size and initial pipe velocity.

Miscellaneous Routines

Routines developed at the University of Delaware under the supervision of Robert A. Dalrymple, Ph.D.

- Beach Fill Calculator
- Depth of Closure
- Sediment Transport Calculator
- Shore Evolution at a Groin
- Rectangular Beach Fill Evolution
- Velocities Under Water Levels

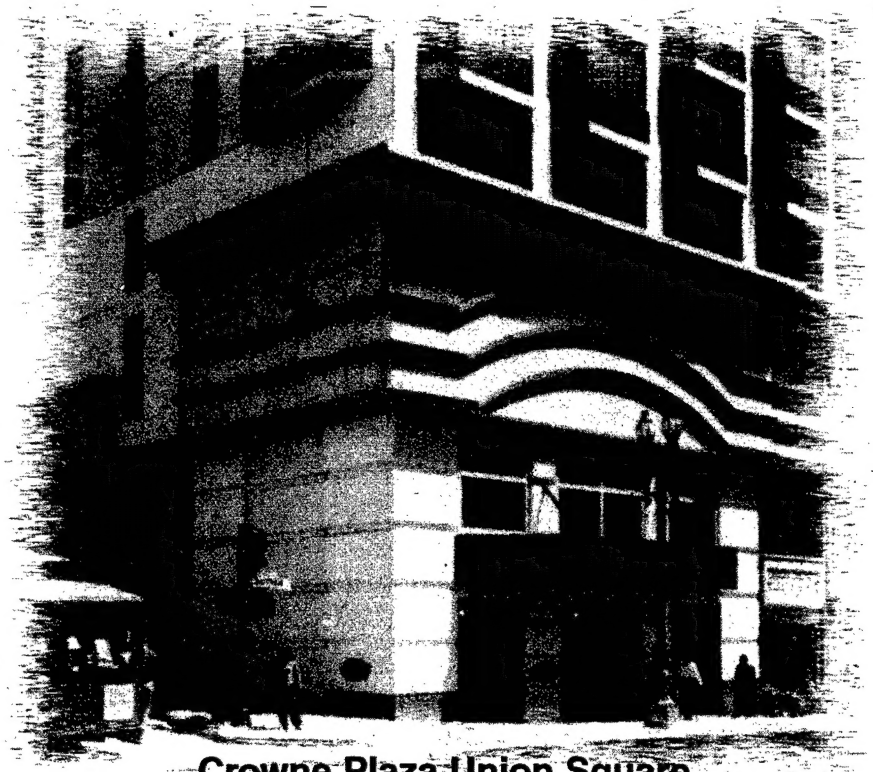




Hotel Information

A block of rooms has been set aside under the name "Corps of Engineers - Dredged Material Assessment and Management Seminar" at the Crowne Plaza Union Square, telephone 888-218-0808. Government rate of $159 single or double (or per diem rate in effect at the time of the seminar) plus tax will be available to eligible attendees. Participants must make their reservations no later than 11 June 2002.

Shuttle services are available at the airport at a rate of approximately $12 one way. Parking at the hotel is $29/day. Restaurants, shopping, and other attractions can be reached by walking or taking the trolley.



Crowne Plaza Union Square

Dredged Material Assessment and Management Seminar

9 - 11 July 2002

Crowne Plaza Union Square
480 Sutter Street
San Francisco, CA

Sponsored by
U.S. Army Corps of Engineers
and
U.S. Environmental Protection Agency

What is being offered?

The seminar focuses on assessment and testing for waters regulated under the Marine Protection, Research, and Sanctuaries Act and the Clean Water Act. Presentations and discussions will include the following:

- ✯ Regulations and Policies
- ✯ Inland, Ocean, and Upland Testing Manuals
- ✯ Sediment Quality Guidelines
- ✯ Corps/EPA Technical Framework
- ✯ DOTS - Technology Transfer Web Site
- ✯ Innovative Technologies
- ✯ Contaminated Sediment Remediation
- ✯ Research
- ✯ Design and Management of CDFs (Contaminant Pathways)
- ✯ Nearshore/Aquatic Placement Models and Tools
- ✯ Dredged Material Management Models (ADDAMS)
- ✯ Beneficial Uses
- ✯ Risk Assessment Application
- ✯ Seasonal Restrictions
- ✯ Bioaccumulation Testing and Interpretation
- ✯ Chronic Sublethal Testing and Interpretation
- ✯ Remediation
- ✯ Case Studies

Who should attend?

- ✯ Dredged material testing, assessment, and management specialists.
- ✯ Federal and State regulatory personnel involved in managing, testing, evaluating, or regulating dredged material.
- ✯ Anyone managing contaminated aquatic sediments.

How do I register?

Beginning 1 January 2002 through 1 June 2002, there are four ways to pre-register:

- ✯ By FAX: 601-634-3528
- ✯ E-mail: *Billie.H.Skinner@erdc.usace.army.mil*
- ✯ Online: *http://www.wes.army.mil/el/dots/training.html*
- ✯ By mail:

  USAERDC, WES
  ATTN: Ms. Billie Skinner, EM-D
  3909 Halls Ferry Road
  Vicksburg, MS 39180-6199

Your registration must provide:

- ✯ Full name
- ✯ Organization and address
- ✯ Telephone number
- ✯ FAX number
- ✯ E-mail address

There will be a fee of $50 for the seminar payable at registration. No checks or credit cards will be accepted.

Pre-registration for the seminar ends on 1 June 2002. Pre-registration is highly recommended to ensure a space. It is recommended that attendees take advantage of the DOTS Online Institute training in preparation for the seminar. It can be accessed at:

http://www.wes.army.mil/el/dots/training.html

Onsite registration will be 3:00-5:00 p.m. on 8 July 2002 and 6:30-8:00 a.m. on 9 July 2002. The seminar will commence at 8:00 a.m. on 9 July and conclude at 5:00 p.m. on 11 July.

Additional information is available from: Ms. Billie Skinner, 601-634-3701; Dr. Robert Engler, 601-634-3624; and Dr. Doug Clarke, 601-634-3770.

A process for setting, managing, and monitoring Environmental Windows for dredging reports

Special Report 262; Marine Board, Transportation Research Board; Ocean Studies Board, Division on Earth and Life Studies; National Research Council

Executive Summary:

Environmental Windows are periods in which regulators have determined that the adverse impacts associated with dredging and disposal can be reduced below critical thresholds, and dredging is therefore permitted. Conversely, seasonal restrictions are applied, and dredging and disposal activities are prohibited, when the perceived increase in potential harm to aquatic resources is above critical thresholds. Since passage of the National Environmental Policy Act in 1969, resource agencies have requested environmental restrictions on dredging and disposal activities with increasing frequency. More than 80 percent of the federal contract dredging program is now subject to some type of restriction.

Windows are an intuitively simple means of reducing risk to biological resources from stressors generated during dredging and disposal activities, including entrainment of fish eggs and larvae, resuspension of buried contaminated sediments, habitat loss, and collisions with marine mammals. The use of windows as a management tool, however, can have significant cost implications for both the U.S. Army Corps of Engineers (USACE) and the local sponsors of dredging projects. For example, windows can prolong completion of dredging projects, delay project deadlines, and increase risk to dredging personnel by shifting dredging to periods of potentially inclement weather and sea states. Because both recommendations to impose Environmental Windows and the cumulative economic impact of their application are increasing, USACE requested that the National Research Council's Transportation Research Board/Marine Board form a committee of experts to conduct a workshop to explore the decision-making process for establishing Environmental Windows, and provide suggestions for improving the process.

A committee with expertise in port operations, dredging, benthic and wetland ecology, commercial fishing, sedimentology, icthyology, environmental protection, and federal and state environmental regulation was formed to conduct the project. The committee gathered information from other experts, conducted case studies, and planned and carried out a workshop. The workshop was designed to solicit the views of the different parties involved in and affected by the process of setting windows. The workshop included representatives from ports, federal and state environmental regulatory agencies, environmental interest groups, dredging operations, and academic experts from relevant fields. Breakout sessions were devoted to such topics as how to evaluate trade-offs between environmental benefits and operational costs, the strengths and weaknesses of current decision-making processes, the scientific and technical justifications used in establishing windows, and dredging technologies designed to minimize environmental impact.

Through examination of case studies and discussions with workshop participants, the committee found that the scientific evidence used in setting windows varies greatly. Some decisions appear to be based on outdated data and information, others on the authority of the resource agency, and only a few on scientific observation. Economic and project considerations appear to have been given minimal consideration in the majority of the cases reviewed. The overall impression that emerged from the case studies examined was a discernible lack of consistency in the current windows-setting process.

Editor's Note: Reprinted from the Prepublication Copy/Uncorrected Proofs of the NRC Special Report 262. The report is currently online awaiting public commentary at *http://www4.nas.edu/trb/onlinepubs.nsf/web/trb_special_reports?OpenDocument*
The final report will be available by contacting *TRBsales@nas.edu*

US Army Corps of Engineers ®

Articles for *Dredging Research* requested:

Dredging Research is an information exchange bulletin for publication of ERDC-generated dredging research results. Included are articles about applied research projects. The bulletin serves all audiences and is accessible on the World Wide Web in addition to a paper circulation of 2,800. Articles from non-ERDC authors are solicited for publication, especially if the work described is tied to the use of ERDC-generated research results. Research articles that complement ERDC research or cover wide field applications are also accepted for consideration. Manuscripts should use a nontechnical writing style and should include suggestions for visuals and an author point of contact. Point of contact is Elke Briuer, APR, at *Elke.Briuer@erdc.usace.army.mil*.

Dredging Research

This bulletin is published in accordance with AR 25-30 as an information dissemination function of the Environmental Laboratory of the U.S. Army Engineer Research and Development Center. The publication is part of the technology transfer mission of the Dredging Operations Technical Support (DOTS) Program and includes information about various dredging research areas. Special emphasis will be placed on articles relating to application of research results or technology to specific project needs. The contents of this bulletin are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or the approval of the use of such commercial products. Contributions are solicited from all sources and will be considered for publication. Editor is Elke Briuer, APR, *Elke.Briuer@erdc.usace.army.mil*. Mail correspondence to the Environmental Laboratory, ATTN: DOTS, Dredging Research, U.S. Army Engineer Research and Development Center, Waterways Experiment Station (CEERD-EP-D), 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, or call (601) 634-2349. Internet address: *www.wes.army.mil/el/dots/drieb.html*.

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